PROC. ENTOMOL. SOC. WASH.
84(1), 1982, pp. 204–207

HEMEROBIUS STIGMA STEPHENS (NEUROPTERA: HEMEROBIIDAE): EXTERNAL MORPHOLOGY OF THE EGG

GARY L. MILLER AND PARIS L. LAMBDIN

Department of Entomology and Plant Pathology, University of Tennessee, Knoxville, Tennessee 37901.

Abstract.—Adult brown lacewings, *Hemerobius stigma* Stephens, collected from white pine were maintained under laboratory conditions at 18.3°C ± 1.0°C and 6L:18D. Females laid 133 (72–176) eggs. Each egg was yellow, 730 μm (675–750) long, 335 μm (300–375) wide, and weighed 0.046 mg. The eggs possessed reticulations arranged in a diagonal pattern on a smooth chorion. The micropylar process consisted of a series of waxlike projections arranged in groups on the anterior pole.

Smith (1923) and Withycombe (1922) provided the first life history investigations on *Hemerobius stigma* Stephens (=*H. stigmaterus* Fitch), including a brief description of the egg. Advances in microscopy have provided the opportunity to examine in greater detail the external morphology of the egg. Mazzini (1976) noted that ultrastructural morphology of the egg chorion and micropyle has provided information useful for inferring phylogenetic relationships for insects in several orders.

Identification of hemerobiids is presently based on morphological characteristics of the adults (MacLeod and Stange, 1981). Our objective was to describe the external morphology of the egg of *H. stigma*. Additional investigations on eggs of related species may assist in identifying other hemerobiid species.

MATERIALS AND METHODS

A laboratory colony of *H. stigma* was established 3 March 1981 at The University of Tennessee from adults collected on white pine, *Pinus strobus* L. The colony was maintained at 18.3°C ± 1.0°C on an 8L:16D cycle.

Male-female pairs were placed in 3.5 × 9.5 cm petri dishes and allowed to mate. The bottom of each petri dish was lined with a 9.0 cm disk of Fisher brand coarse filter paper. A 10 dr vial filled with distilled water and plugged with cotton was placed in each petri dish to provide water and

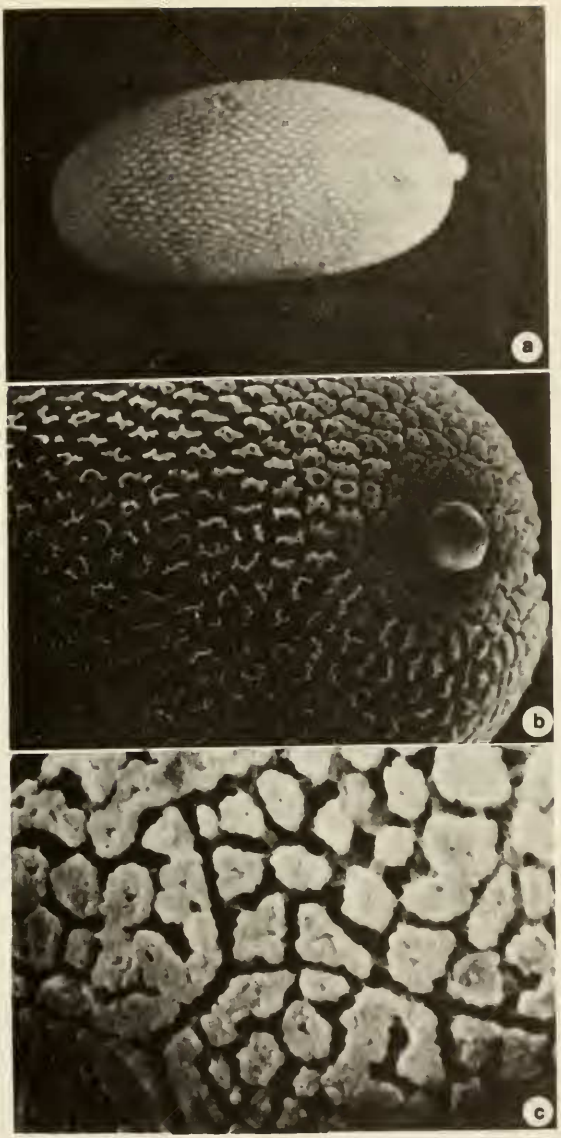

Fig. 1. a, Egg of *Hemerobius stigma* (116×); b, Surface of anterior pole showing waxlike projections and micropylar process (144×); c, Tubercles and fissures on the micropylar surface (1200×).

moisture. A cotton ball, ca. 1.5 cm diam., and pine needles were placed in the petri dish to serve as a substrate for oviposition. Females were maintained until death to determine fecundity and ovipositional habits.

Eggs were collected within 24 h after oviposition and weighed using an Ainsworth SCV electrobalance. Egg size was determined using an ocular micrometer. Egg color was compared with color charts in the Munsell Book of Color (1929), and the color description was recorded (e.g., yellowish red in Munsell might be written as 5 YR 6/8 or a No. 5 yellow red hue, color value No. 6 and a chroma No. 8).

External morphology was examined using an ETEC Autoscan scanning electron microscope. Eggs were placed on aluminum studs and coated with gold-palladium in a Denton Vacuum DV-515 vacuum evaporator. S.E.M. photographs were taken using Polaroid 55 film, and photomicrographs were taken using 35 mm Kodak Panatomic X film.

Results

Field-collected adult females of *H. stigma* maintained in the laboratory laid an average of 133 (72–176) eggs. Eggs were deposited singly or in groups of 2–5 on filter paper, cotton balls, pine needles, and in the scaly sheath at the base of the needles. Withycombe (1922) reported that females occasionally laid up to seven eggs in groups.

Eggs were ellipsoid (Fig. 1a), 730 μm (675–750) long, 335 μm (300–375) wide, and weighed 0.046 mg. Color of eggs 24–72 h after deposition was yellow (5Y 8/6), but changed to yellowish red (10 YR 7/6) after 96 h, followed by more intensified darkening (10 YR 7/8) with embryonic development until eclosion after ca. 120 h. Hinton (1981) concluded that many insect eggs undergo coloration change during incubation due either to a change in color of the chorion or to a color change of the embryo as seen through the eggshell. We observed that the maturing embryo caused color changes in the chorion.

Withycombe (1922) reported the surface of *H. stigma* eggs was smooth, but broken by many small granular pits. Smith (1923) described the chorion as dotted with undulating rows of minute or microscopic elongate white raised, rounded spots. Scanning electron microscopy revealed that the "spots" consisted of irregular shaped waxlike projections somewhat evenly spaced on a smooth chorion (Fig. 1b). These projections form diagonal patterns around the egg. However, the chorion may lack these reticulations where the egg is attached to the substrate. The projections near the anterior pole fuse to encircle the micropylar process. The waxlike projections directly adjacent to the micropyle are connected by narrow bridges similar to those on the chorion of *Chrysopa carnea* Stephens (Mazzini, 1976). The projections on the surface of the chorion probably form a boundary layer

to retain air which establishes a humidity gradient that retards water loss (Hinton, 1981).

Described simply as a button-like structure on most hemerobiid eggs (Smith, 1923; Withycombe, 1923), the micropylar process is nipple-shaped and consists of irregularly shaped, tubercle-like projections grouped into sections separated by fissures (Fig. 1c). Narrow bridges proximally located interconnect each tubercle with adjacent tubercles. Each tubercle possesses an aperture usually centrally located. Additional studies may reveal that ultrastructure of hemerobiid eggs is diagnostic at the species level.

Acknowledgment

Grateful appreciation is extended to A. G. Wheeler, Jr., Bureau of Plant Industry, Pennsylvania Department of Agriculture, for his critique of this manuscript before publication.

Literature Cited

Hinton, H. E. 1981. Biology of insect eggs. Pergamon Press Ltd, New York, Vol. 1. 473 pp.

MacLeod, E. G. and L. A. Stange. 1981. The brown lacewings of Florida (Neuroptera: Hemerobiidae). Fla. Dep. Agric. Consum. Serv. Div. Plant Ind. Entomol. Circ. 227: 1–4.

Mazzini, M. 1976. Fine structure of the insect micropyle—III. Ultrastructure of the egg of *Chrysopa carnea* Steph. (Neuroptera: Chrysopidae). Int. J. Insect Morphol. Embryol. 5: 273–278.

Munsell Book of Color. 1929. Munsell Color Co., Inc., Baltimore. 26 color charts.

Smith, R. C. 1923. The life histories and stages of some hemerobiids and allied species (Neuroptera). Ann. Entomol. Soc. Am. 16: 129–151.

Withycombe, C. L. 1922. Life-history of *Hemerobius stigma* Steph. Entomologist 55: 97–99.

———. 1923. Notes on the biology of some British Neuroptera (Plannipennia). Trans. Entomol. Soc. Lond. 1922: 501–594.